

February 17, 2005

TO: Wisconsin Potential Study Advisory Committee and stakeholders

FROM: Scott Pigg, ECW

RE: Advance materials for February 24 stakeholder meeting

Below are advance materials for the February 24, 2005 Potential Study Stakeholder meeting covering the following four markets:

1. (9:00-10:30 am) Market 19 — **Homeowner furnace replacement**
2. (11:00-12:30 pm) Market 20 — **Homeowner central AC purchase**
3. (1:00-2:30 pm) Market 22 — **Homeowner/renter retail room AC purchase**
4. (3:00-4:30 pm) Market 26 — **Dehumidifier early retirement or purchase upgrade**

(If you are planning to attend this meeting, and have not already done so, please RSVP to sbenzmiller@ecw.org. Lunch will be provided for those who will be present between 12:30 and 1:00)

A generic discussion guide follows, along with some facts about the markets to be discussed and some issues I have identified. These are simply meant to get the discussion going; they're not intended to limit the scope of the discussion.

Generic Discussion Guide

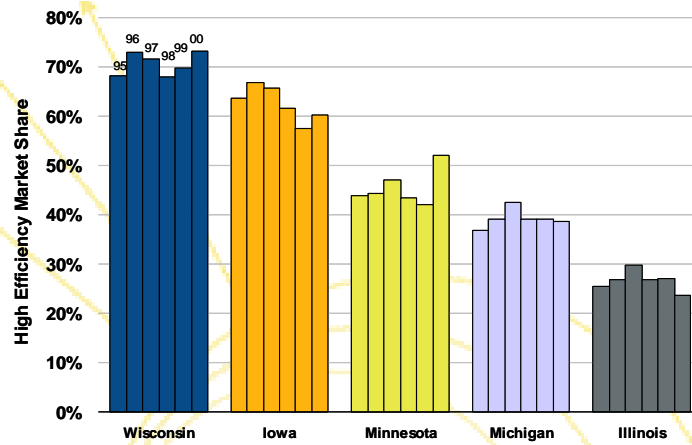
1. Size and nature of the market
 - a. What are the important market channels and actors for this market?
 - b. What are the important motivators and barriers to energy efficiency in this market?
2. Measure impacts
 - a. What are the important measures or energy efficiency upgrades to contemplate for this market?
 - b. What are the most important variables that drive per-unit impacts and measure life for these measures?
 - c. Do measure impacts and measure life vary among sub-groups or across participants in future years in important ways that we should consider?
3. Program approaches
 - a. What program approaches to improving energy efficiency in this market have been used in Wisconsin and elsewhere?
 - i. Are there specific programs (Wisconsin or elsewhere) that we should be using as models for estimating achievable potential for Wisconsin?
 - b. What novel program approaches should we consider?
 - c. What participation levels and program costs are likely for these program approaches?
 - d. To what extent is free ridership an issue to be considered for these program approaches?
 - e. To what extent can these program approaches be expected to engender broader market effects beyond immediate participants?
4. Information resources (identify throughout the above)
 - a. What information sources can we draw upon to address this question?

Homeowner Furnace Replacement Market

Some relevant facts

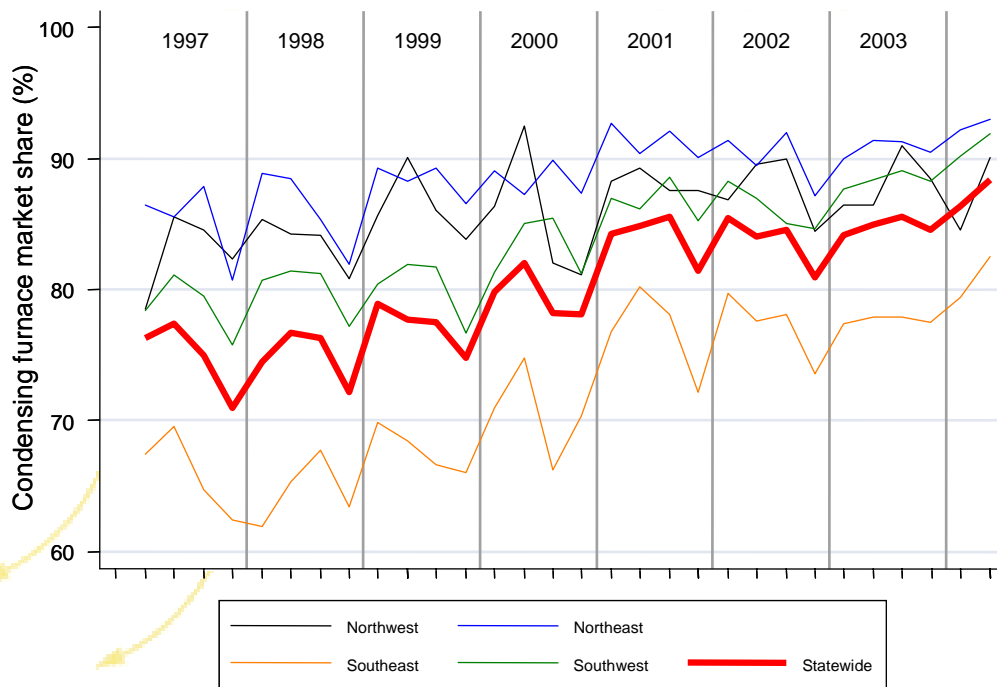
- Furnaces are present in about 75 percent of Wisconsin homes (source: ECW Residential Characterization Study).
- 4.4 percent of surveyed homeowners report buying a new furnace in the previous year. If new homes are excluded, this figure becomes about 3.4 percent (source: ECW 2003 Appliance Sales Tracking Study). Applied to Census 2000 data, this extrapolates to about 46,000 furnaces sold for use in existing homes each year
- Between 86,000 and 106,000 furnaces were sold in Wisconsin each year between 1995 and 2000 (source: GAMA)
- Wisconsin had the highest market share for high-efficiency, condensing furnace in the nation between 1995 and 2000, and was considerably above that of most neighboring states (see Figure 1 below) (source: GAMA).
- The market share for condensing furnaces appears to be slowly rising, in particular in the southeast corner of the state, which has lagged behind the rest of the state (see Figure 2 below) (source: ECW FACTS project).
- Focus on Energy provided \$150 rebates on about 8,000 electrically efficient variable speed furnaces in Program year 2003/04. About 7,200 of these were for furnaces in existing homes (source: Glacier Consulting)
- The market share for variable speed furnaces with electronically commutated motors (ECMs) is about 20 percent of all furnaces sold (see Figure 3 below) (source: ECW FACTS project)
- An ECW field study showed about 400 kWh savings from ECM furnaces when operated in auto-fan mode. Savings are about 3,000 kWh for year-round continuous-fan operation (source: ECW furnace electricity study).
- A study of fan operation practices by the Focus evaluation team showed that many contractors recommend continuous-fan operation for purchasers of ECM furnaces. The estimated net savings accounting for these behavior changes is about 780 kWh per furnace in existing homes (source: Glacier Consulting report).

FIGURE 1, MARKET SHARE FOR HIGH EFFICIENCY FURNACES, 1995-2000.



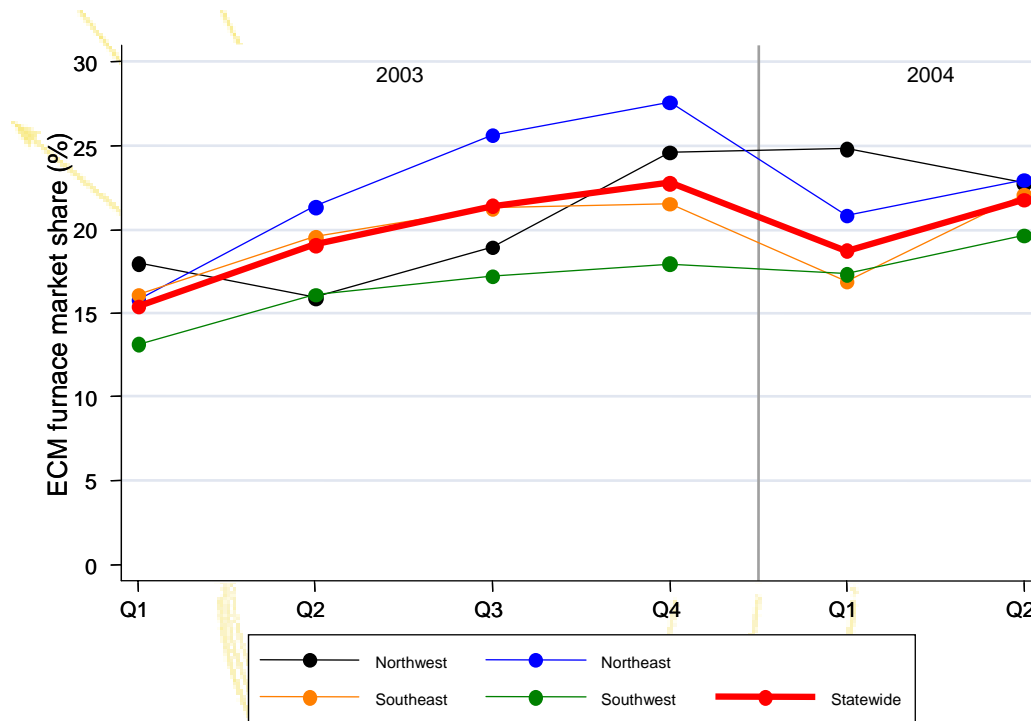
Source: GAMA

FIGURE 2, WISCONSIN CONDENSING FURNACE MARKET SHARE (1997 - 2004Q2), BY REGION AND STATEWIDE.



Source: ECW FACTS project

FIGURE 3, WISCONSIN ECM FURNACE MARKET SHARE (2003-2004Q2), BY REGION AND STATEWIDE.



Source: ECW FACTS project

Issues for discussion

- Is there any programmatic potential from promoting condensing furnaces, given the high and growing market share in Wisconsin?
- What is the potential for pushing the market share for ECM furnaces with incentives? Is there a “tipping point” at which this market could be self-sustaining?
- Can programmatic intervention mitigate the extent to which contractors tell purchasers of ECM furnaces to switch to continuous-fan operation?
- Is the furnace market for new homes distinct enough that it should be handled separately in the New Construction market for the study (Market 24), or is it more logical to include it here?
- What could program efforts to improve installation practices achieve in this market? Would these efforts be distinct from similar efforts for central AC installation practices, or is it really just one “best practices” area for residential HVAC installation?

Central Air Conditioner Purchase Market

Some relevant facts

- The saturation of central AC in single-family homes was 53 percent in 1999 (source: ECW Residential Characterization Study)
- 5.4 percent of single-family homeowners reported buying a central air conditioner in 2003. If new homes are excluded, this figure becomes 4.1 percent. (source: ECW Appliance Sales Tracking Survey). This translates into about 56,000 units sold for use in existing single-family homes each year.
- About 40 percent of central AC purchases for older homes in 2003 were replacements of existing systems, 20 percent were purchases for homes that had been using room AC, and 40 percent were purchases for homes that lacked air conditioning (source: ECW Appliance Sales Tracking Survey)
- Focus on Energy provided a \$150 rebate for about 6,500 SEER 12 units in Program Year 2003/04, of which about 500 were for new homes. Focus provided a \$200 rebate for about 4,000 units with SEER 13 or higher in the same period (source: Glacier Consulting).
- The market for SEER 13+ units has grown in the last several years to make up about 15 percent of sales (see Figure 4) (source: ECW FACTS project).
- New federal efficiency standards coming into effect in January 2006 will increase the minimum SEER to 13.
- The incremental savings for upgrading Wisconsin air conditioners beyond SEER 13 are generally small (see Table 1 below).
- Interviews with contractors active in the Focus Heating and Cooling Initiative indicate that two-thirds to three-quarters were using airflow and refrigerant charging “best practices” for new AC installations prior to involvement in the program. These early participants may not be representative of the larger contractor population, however. (source: Glacier Consulting)

FIGURE 4, SEER DISTRIBUTION OF NEW WISCONSIN CENTRAL AIR CONDITIONERS
(1997-2004Q2).

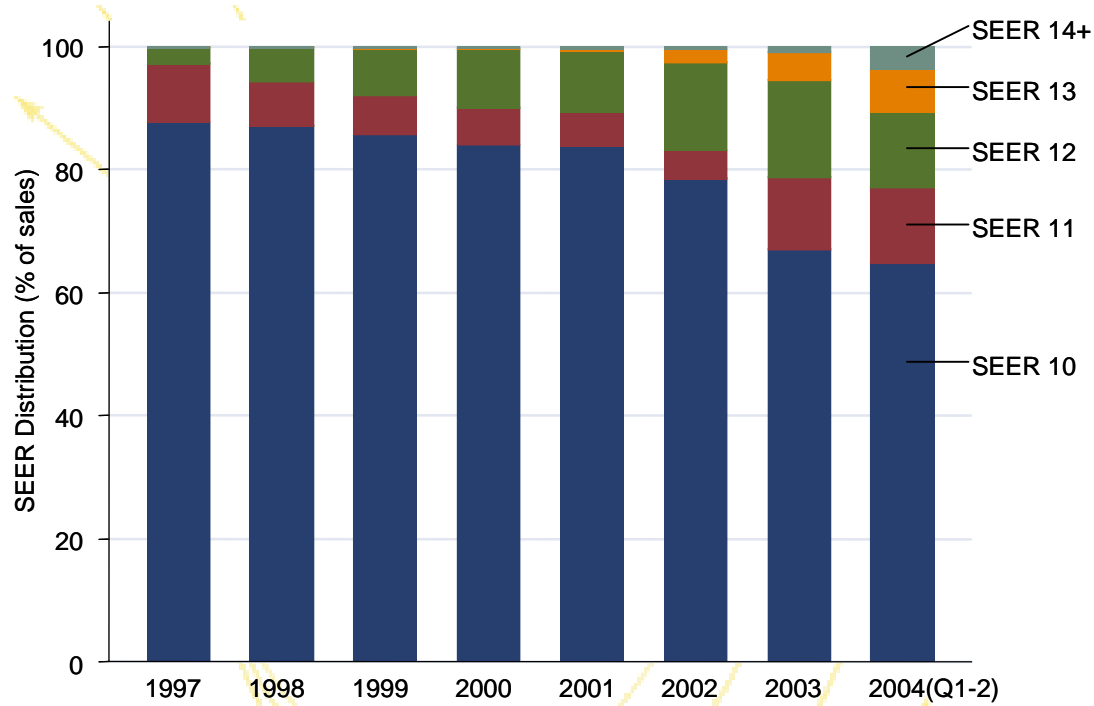
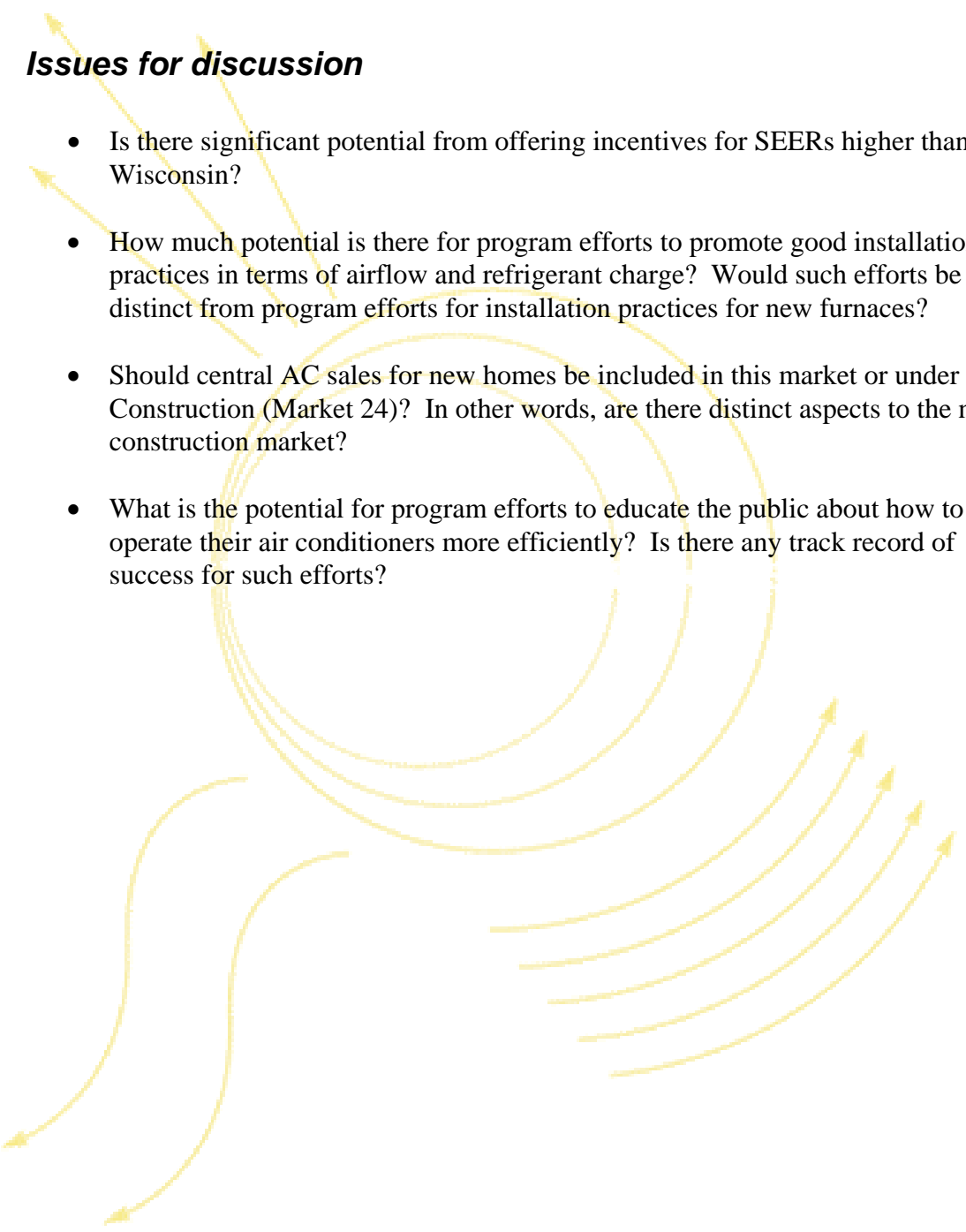


TABLE 1, ANNUAL COST AND SAVINGS FOR VARIOUS CENTRAL AC EFFICIENCY LEVELS.

Size (BTUh)		30,000		Impact Scenarios					
Annual hours of operation		400							
Electricity price (cents/kWh)		10							
Type	SEER	kWh	\$	Incremental Upgrade		Accelerated Replacement			
						Accelerated Period		Normal Period	
				kWh	\$	kWh	\$	kWh	\$
Existing	8	1,500	\$150						
Standard	13	923	\$92			577	\$58	0	\$0
Efficient Alternatives	14	857	\$86	66	\$7	643	\$64	66	\$7
	15	800	\$80	123	\$12	700	\$70	123	\$12
	16	750	\$75	173	\$17	750	\$75	173	\$17
	17	706	\$71	217	\$22	794	\$79	217	\$22
	18	667	\$67	256	\$26	833	\$83	256	\$26
	19	632	\$63	291	\$29	868	\$87	291	\$29
	20	600	\$60	323	\$32	900	\$90	323	\$32

Issues for discussion

- Is there significant potential from offering incentives for SEERs higher than 13 in Wisconsin?
 - How much potential is there for program efforts to promote good installation practices in terms of airflow and refrigerant charge? Would such efforts be distinct from program efforts for installation practices for new furnaces?
 - Should central AC sales for new homes be included in this market or under New Construction (Market 24)? In other words, are there distinct aspects to the new construction market?
 - What is the potential for program efforts to educate the public about how to operate their air conditioners more efficiently? Is there any track record of success for such efforts?
- 
- A decorative graphic consisting of several yellow arrows and concentric circles. Two arrows point towards the top-left from the bottom-left. A series of five concentric circles is centered in the middle of the page. A series of five curved arrows points towards the top-right from the bottom-right.

Retail Room AC Purchase

Some relevant facts

- The saturation of room AC in single family homes was 22 percent in 1999 (source: ECW Residential Characterization Study). Similarly, 28 percent of rental households have a tenant-owned room AC unit; these are mostly in single-family homes and 2-4 unit rental properties (source: ECW Rental Characterization Study).
- 5.3 percent of 2003 respondents to the ECW 2003 Appliance Sales tracking survey reported having purchased a room air conditioner in the previous 12 months. Combined with Census 2000 data, this works out to about 110,000 units sold each year.
- About two-thirds of survey respondents to the Center's Residential Characterization Study reported using their room air conditioner "on only a few days or nights when really needed."
- Statistical analysis of billing data for single-family owner-occupied homes suggests room AC use accounts for about 800 ± 200 kWh of annual electricity use on average. This works out to about 500 hours of operation per year given an average of 1.5 units per home, average output capacity of 8,000 Btu/hr and average EER of 8 for existing units. (source: ECW Residential Characterization Study)
- The EPA's Energy Star savings calculator for room air conditioners assumes 487 hours of operation for Madison, WI. The calculator shows annual savings of \$4 for upgrading from EER 9.7 to EER 10.7 at 10 cents/kWh.
- Focus on Energy does not currently offer incentives for room air conditioners

Issues for discussion

- To what extent is the potential for efficiency improvements for room air conditioners driven by stocking practices?
- Do high efficiency room air conditioners offer additional features or comfort benefits that can be used in promoting these units?
- What is the incremental cost between a standard room air conditioner and a high efficiency unit?

Dehumidifier early retirement and upgrade on purchase

Some Relevant facts

- About two-thirds of homeowners report having a dehumidifier; 18 percent of renters report having one, of which about two-thirds are tenant-provided (see Table 2). These figures are reasonably comparable to AP-6 figures for Wisconsin Power and Light (see Attachment A). Combined with Census 2000 data, this works out to about 870,000 dehumidifiers in single-family owner-occupied homes, and 82,000 tenant-owned units in rental households.
- About two-thirds of homeowners report running their dehumidifier “all summer long”; about half of renters report doing so (see Table 2).
- Focus on Energy currently offers a \$50 rebate for an Energy Star labeled Therma-Stor dehumidifier.
- See Attachment A for additional information and program concepts provided by Wayne Deforest (Wisconsin Energy Conservation Corporation).

TABLE 2, SURVEY DATA ON SATURATION, OWNERSHIP AND USE OF DEHUMIDIFIERS IN WISCONSIN.

		Single-family Homeowners	Renters
Households with a dehumidifier		64%	18%
Who provided it?	Tenant		69%
	Landlord		31%
How much is it used?	Rarely	11%	12%
	Part of the summer	24%	40%
	All summer long	65%	48%
Sources: ECW Residential Characterization Study, ECW Rental Characterization Study			

Issues for discussion

- What is the potential for persuading people to give up a dehumidifier, or install an interlock for peak demand savings?
- What is the cost differential between an Energy Star and conventional dehumidifier?
- Is there any field data on dehumidifier operating hours and wattage draw in climates like Wisconsin?

Attachment A

November 29, 2004

To: Scott Pigg

From: Wayne De Forest

Re: Information requested for dehumidifiers

Overview

The following provides information you requested for assessing the potential for savings from dehumidifiers. The savings from dehumidifiers depends on the type of program and the amount of dehumidification use. The following table summarizes savings for four types of programs. Next, each program is described and the basis of savings described. Finally, baseline information is provided. Baseline information includes Wisconsin Power & Light Company's estimate of 58.8% saturation of dehumidifiers.

Program	kW	kWh	Source
Turn-in (no replacement, e.g., eliminate need for dehumidifier)	0.4 to 0.5 ¹	450	WPL enduse forecast
Turn-in with interlocked replacement (or time clock)	0.4 to 0.5	225 to 325	Interlock prevents peak operation; ACEEE says 2 to 3 times more efficient
Replace working unit with Energy Star	0.2 to 0.3	225 to 325	ACEEE says 2 to 3 times more efficient
New conventional to Energy Star	0.05	79	Energy Star Calculator

Turn-in

This program design reflects a dehumidifier turn-in with no replacement. Program components would be directed at reducing the need for a dehumidifier. Savings are based on eliminating the dehumidifier load shown in Wisconsin Power & Light Company's enduse forecast. Dehumidifiers turned in might have even higher savings because they might be using more than the average kWh use listed.

¹ The 0.5 kW reflects that turned in dehumidifiers will be older than the 2004 average dehumidifier use. The 1995 average kW (according to WPL) was 0.5 kW.

Turn-in with interlocked replacement

This program design reflects a dehumidifier turn-in with a new replacement dehumidifier. Savings estimates of 50% are conservative as at least some dehumidifiers turned in will have freeze up problems and ACEEE explains Energy Star can be as much as 3 times more efficient than commonly used dehumidifiers (66% savings).

Frost can form on the condensing coils if the air temperature drops below 65 degrees, and may negatively affect the performance of the product by causing the compressor to cycle on and off repeatedly without removing moisture from the air. If this happens, the unit should be switched off and allowed to defrost before it is turned back on. Some dehumidifiers come with an **antifrost sensor**, which will automatically turn the unit off if the air temperature drops below a certain point.

ACEEE states the following on savings from Energy Star dehumidifiers:

The ENERGY STAR program currently lists dehumidifiers meeting minimum efficiency requirements. Some of the more efficient models have efficiencies of 2.75 liters/kWh, approximately two to three times higher than the baseline models commonly found in basements.

While dehumidifiers generally operate at the same time as central air conditioners, there is no real reason why dehumidifiers in basements must operate at the time of utilities' system peak demand. For instance, dehumidifiers could be interlocked with the central air conditioner to not run when the air conditioner is operating. This might be done at the time of air conditioner replacement or repair. Or dehumidifiers could be turned-off by time a clock or other means to not operate during peak times. .

Replace working unit with Energy Star

This program is the same as above but does not include the peak savings from interlock.

New conventional to Energy Star

While a program could simply promote Energy Star dehumidifiers at the time a customer is buying a dehumidifier, such a program is not currently under consideration. Savings are for illustration only. The energy savings are from the Energy Star calculator on a 20 pint dehumidifier.

Baseline information

Wisconsin Power & Light – End-use forecast Advance Plan 6

Single Family - Base 2004 usage

458 kWh

0.42 kW 2004 summer coincident demand

0.45 kW 1995 summer coincident demand
58.8% saturation 2004

Multi Family - Base 2004 usage

321 kWh
0.29 kW
23.9 % saturation 2004

Madison Gas & Electric website

25 pint
600 typical watts
432 kWh (3mo * 144 kWh / mo.)
576 kWh (4mo * 144 kWh /mo.)

EPA Energy Star Calculator

20 pint
865 kWh new Energy Star (line 31)
944 kWh new conventional (line 31)

